MONOCHORIA CYANEA AND M. AUSTRALASICA (PONTEDERIACEAE) IN AUSTRALIA

by

HELEN I. ASTON *

ABSTRACT

Aston, Helen I. *Monochoria cyanea* and *M. australasica* (Pontederiaceae) in Australia. *Muelleria* 6(1):51-57 (1985) — Australian plants generally referred to *Monochoria cyanea* (F.Muell.) F.Muell. have been investigated morphologically and are shown to consist of two entities which are here referred to *M. cyanea* s. str. and to *M. australasica* H. N. Ridley. Typification of these names is discussed and a lectotype is selected for the former.

INTRODUCTION

The genus *Monochoria* C.Presl consists of several species of conspicuous-flowered, emergent, aquatic plants distributed in mainly tropical regions from Africa to Japan and through south-east Asia to Australia. Backer (1951) recognised two sections, viz. sect. *Monochoria* (as *Eumonochoria*) and sect. *Limnostachys* (F.Muell.) Backer. In section *Monochoria* one anther is much larger than the other five and its filament bears a small lateral appendage. In section *Limnostachys* all six anthers are more or less equal in size and there is no lateral appendage to any filament.

The section *Limnostachys* is apparently confined to Australia where all plants belonging to it are currently referred to *Monochoria cyanea* (F.Muell.) F.Muell. A collection from "near Darwin" was described in 1918 as *M. australasica* H. N. Ridley but this name has been considered a synonym of *M. cyanea* (Backer 1951). Backer's suggestion that *M. australasica* is only a submerged or juvenile form is quite incorrect. The present author has investigated certain morphological features and, from the results presented below, has concluded that each of the names *M. cyanea* and *M. australasica* refers to a distinct species.

MORPHOLOGY

Methods

Collections incorporated as *M. cyanea* at BRI, CANB, DNA, MEL, NSW, NT and PERTH were examined. Initial sorting suggested that two taxa were probably represented by the one name and subsequent measurements confirmed this (Figs 1 to 3). Measurements of floral parts were made on material softened in boiling water with a little teepol added, or, in a few cases, were made from flowers preserved in 70% alcohol or in FAA solution. All other measurements were made from dried specimens.

The following characters need explanation:

Leaf — the leaf subtending the inflorescence, not basal leaves.

Petiole — that portion of the inflorescence leaf lying between the sheath and the blade.

Sheath — includes the small ligule.

Raceme — from the attachment of the lowest flower to the outer extremity of the extended, apical flower.

Filament — measured along its midvein from the point where the filament first joins the anther to the point where it unites to the perianth. This avoids inconsistencies which would have arisen if only the free portions of the irregularly-united filaments had been measured. Average measurement of 4-6 filaments in the one flower was used.

Anther — average of 4-6 anthers in the one flower was used (anthers and filaments were not always all present or in a measureable state).

Style plus stigma — the length along the style curvature. Includes the majority of the stigmatic papillae.

*National Herbarium of Victoria, Birdwood Avenue, South Yarra, Victoria, Australia 3141.

Filament lengths and anther lengths of each flower were initially averaged for plotting and the anther/filament % ratio was calculated using these averages. This was done in order to indicate any between-flower variation. These averages were also used in selecting the values given in Table 1. Subsequently the lengths and ratio were recalculated using individual rather than average measurements. The results gave only slight expansion of the standard deviations to those obtained initially and indicate that the averages used in this study have portrayed genuine distinctions equally as well as individual measurements. The data based on individual measurements are:

M. cyanea — Anther: mean 1.8, S.D. 0.4, range 1.2-3.4, n = 327. Filament: mean 3.6, S.D. 0.7, range 1.8-5.7, n = 271. Anther/filament %: mean 49, S.D. 11, range 26-88, n = 101.

M. australasica — Anther: mean 4.0, S.D. 0.7, range 2.0-5.6, n = 155. Filament: mean 2.9, S.D. 0.7, range 1.2-5.0, n = 96. Anther/filament %: mean 134, S.D. 35, range 83-235, n = 38.

Results

Recognition of *M. cyanea* and *M. australasica*

Working graphs showed that five of the characters examined each segregated upon plotting into two groups with nil or only minor overlap between the groups. These characters were the average length of anther, length of style plus stigma, and the ratios of anther length/filament length, anther length/tepal length and petiole length/sheath length. For each character, values were selected for distinguishing its two groups, which I now refer to *M. cyanea* (F. Muell.) F. Muell. s. str. and *M. australasica* H. N. Ridley (Table 1).

Table 1. The five major characters and their values used in segregating collections of *Monochoria cyanea* and *M. australasica*.

	Monochoria cyanea	Monochoria australasica
Style + stigma (length)	< 6 mm	$\geqslant 6$ mm
Anther (average length)	< 3 mm	$\geqslant 3$ mm
Anther/filament % (lengths)	$\leqslant 80$	$\geqslant 100$
Anther/tepal % (lengths)	$\leqslant 16$	> 16
Petiole/sheath % (lengths; inflorescence leaves only)	> 40	$\leqslant 20$

Of the 150 collections for which four or five of the above characters were available, 146 (97%) had at least four of the characters fitting the values shown in table 1 for either *M. cyanea* or *M. australasica*. Of the 129 collections which had all five characters measureable 117 (91%) fitted the selected values for either *M. cyanea* or *M. australasica* in all five and a further 8 (6%) fitted one or other of the species in four of the five characters and had only a marginal misfit in the fifth character. Only 4 (3%) of the 150 collections showed mixed character values and were not readily assignable to either species.

The ready segregation of the great majority of collections on the basis of five separate characters justifies, in my opinion, the recognition of two distinct species.

It is interesting to note that Verdcourt (1960), working with African *Monochoria* in the section *Monochoria,* a traditionally difficult group for taxonomists, also used the shortness of the petiole above the sheath of the inflorescence leaf as a feature to distinguish a new species *M. brevipetiolata*. This is the most easily noticeable of the five characters used in the present study for distinguishing *M. australasica* from *M. cyanea*.

Variation Within *M. australasica*

Distribution maps (Figs 4 and 5) show that the geographical ranges of *M. cyanea* and *M. australasica* are almost mutally exclusive and that the latter species apparently has two disjunct centres of occurrence, one in the north of the Northern Territory and one on Cape York Peninsula, Queensland. The Queensland collections of *M. australasica* tend to be intermediate in some of their vegetative and inflorescence characters between those of typical *M. australasica* from the Northern Territory and *M. cyanea*. For each character which exhibits this tendency a separate bar for each of the geographical centres of *M. australasica* is included in the measurement charts (Figs 1 to 3). These charts illustrate the following statements:

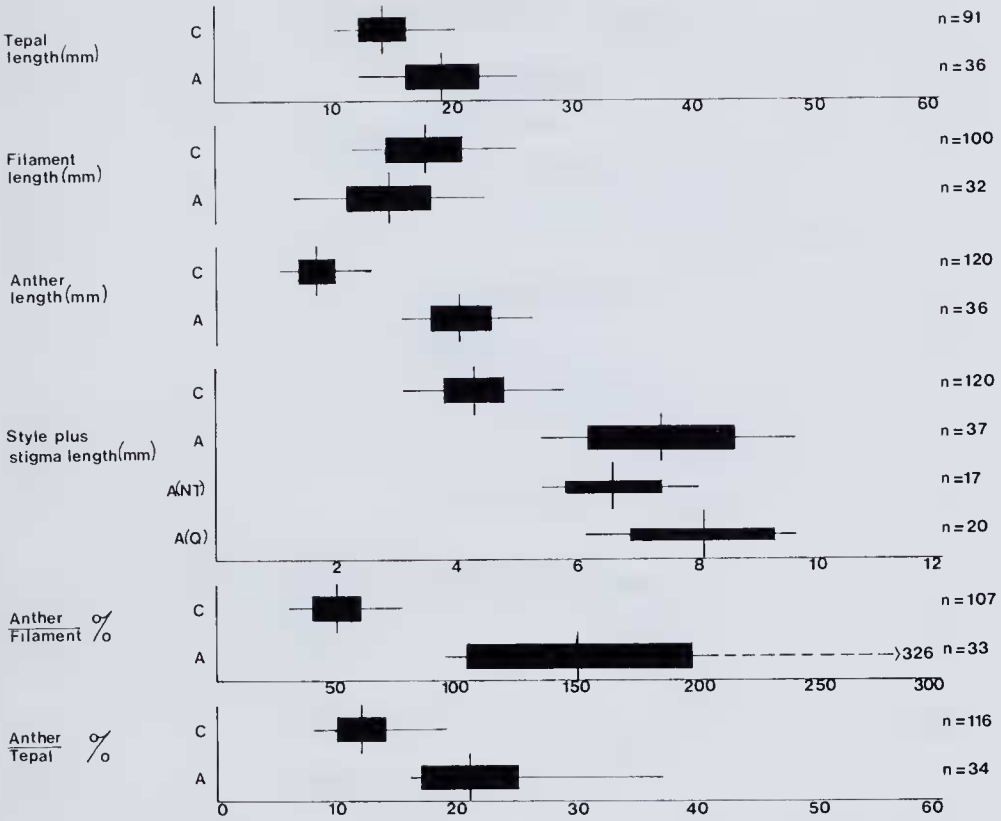

Fig. 1. Measurements and proportions of floral parts in *Monochoria*. Note that anther and filament lengths refer to the averages of the lengths for each flower. Mean, range and standard deviation charted — where necessary a dotted line is used to connect the usual range to a solitary anomalous extreme; n = number of measurements.

C = *M. cyanea*
A = *M. australasica*, all collections.
A (NT) = *M. australasica*, Northern Territory collections only.
A (Q) = *M. australasica*, Queensland collections only.

Leaf — The inflorescence leaf blades of typical Northern Territory populations of *M. australasica* are narrow with the width usually only 6-26% of the blade length. Contrastingly, in *M. cyanea* the blade width is usually 32-55% of the length. Queensland plants of *M. australasica* show an intermediate value of 19-45%.

Sheath lengths on inflorescence leaves of Queensland populations of *M. australasica* are usually less than those of Northern Territory plants, therefore tending toward the short sheaths of *M. cyanea*.

Inflorescence — The absolute lengths of the peduncle and the raceme of Queensland populations of *M. australasica* are usually less than those lengths in Northern Territory populations and tend to be intermediate in length between the latter and the short peduncles and racemes of *M. cyanea*. There is, however, no significant difference in the ratio of raceme length to peduncle length between the Queensland and Northern Territory populations.

The number of flowers per raceme is similar in both the Queensland and Northern Territory collections of *M. australasica* but, because of the usually shorter raceme of the former, the distance between the flowers (represented by raceme length divided by number of flowers) is usually a little less in Queensland collections. This tendency is toward the often very densely crowded flowers of *M. cyanea*.

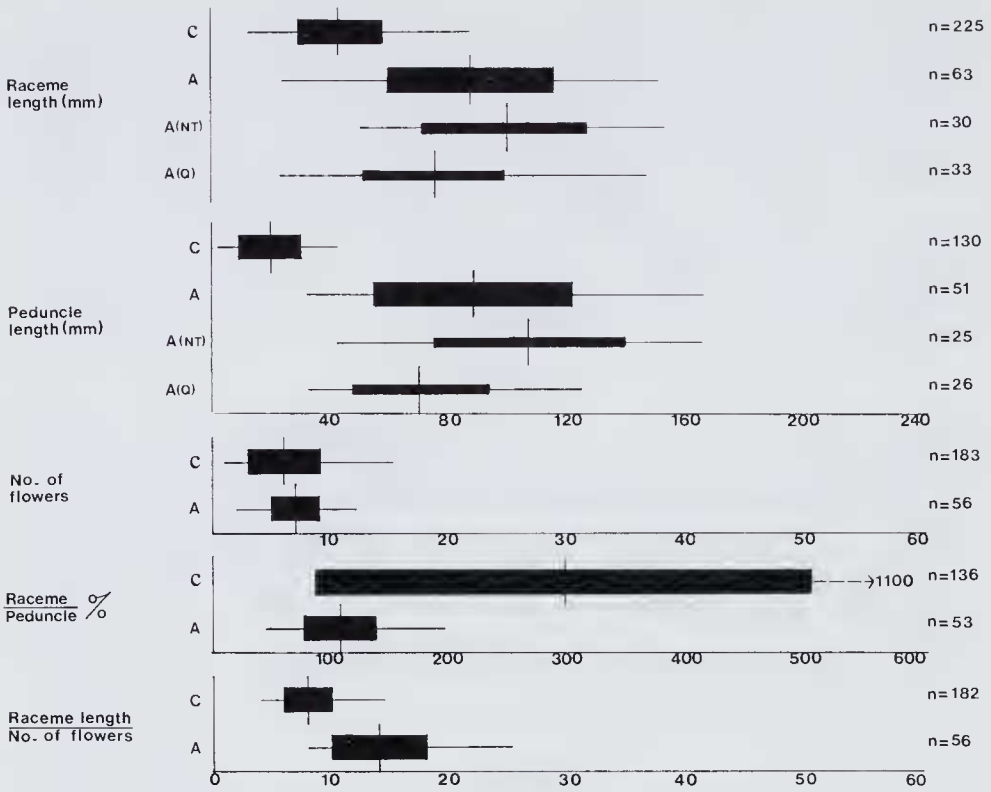

Fig. 2. Measurements and proportions of the inflorescence in *Monochoria*. For explanation see caption to figure 1.

Style plus stigma — Queensland collections of *M. australasica* exhibit longer style plus stigma measurements than those of Northern Territory collections, thereby showing a tendency away from the much shorter style plus stigma lengths of *M. cyanea*. Note that this reverses the direction of the tendencies shown by leaf and inflorescence characters.

Although collections of *M. australasica* from Queensland display some differences from those from the Northern Territory, the magnitude of the differences is small and the overlap in measurements is considerable. The number of measurements of any one character for either area was also limited, varying from 17 to 33, and it has not been possible to critically examine or measure any populations in the field. The apparent differences between Northern Territory and Queensland populations may or may not prove to be real when more collections become available and on present knowledge there is no justification for suggesting any infraspecific taxa within *M. australasica*.

TYPIFICATION

Monochoria australasica Ridley, J. Straits Branch Roy. Asiat. Soc. 79:100 (1918). TYPE: "North Australia; near Darwin 8. (C.E.F. Allen. Nov. 1914.)". HOLOTYPE: "81 C.E.F. Allen Water Hyacinth Feb 14" on field label, "N. Australia: near Darwin. 81. Monochoria Coll. C.E.F. Allen. Rec. 4, Nov. 1914." on Herb. Kew label (K, photo only seen). ISOTYPE: "81 C E F Allen Water Hyacinth! Feb 14" on field label, "N.T. C E F Allen 81 2-1914" on Herb. NSW label (NSW).

The field labels on both type sheets are in the same distinctive handwriting and virtually identical. They show that the date of collection of the material was February 1914, not

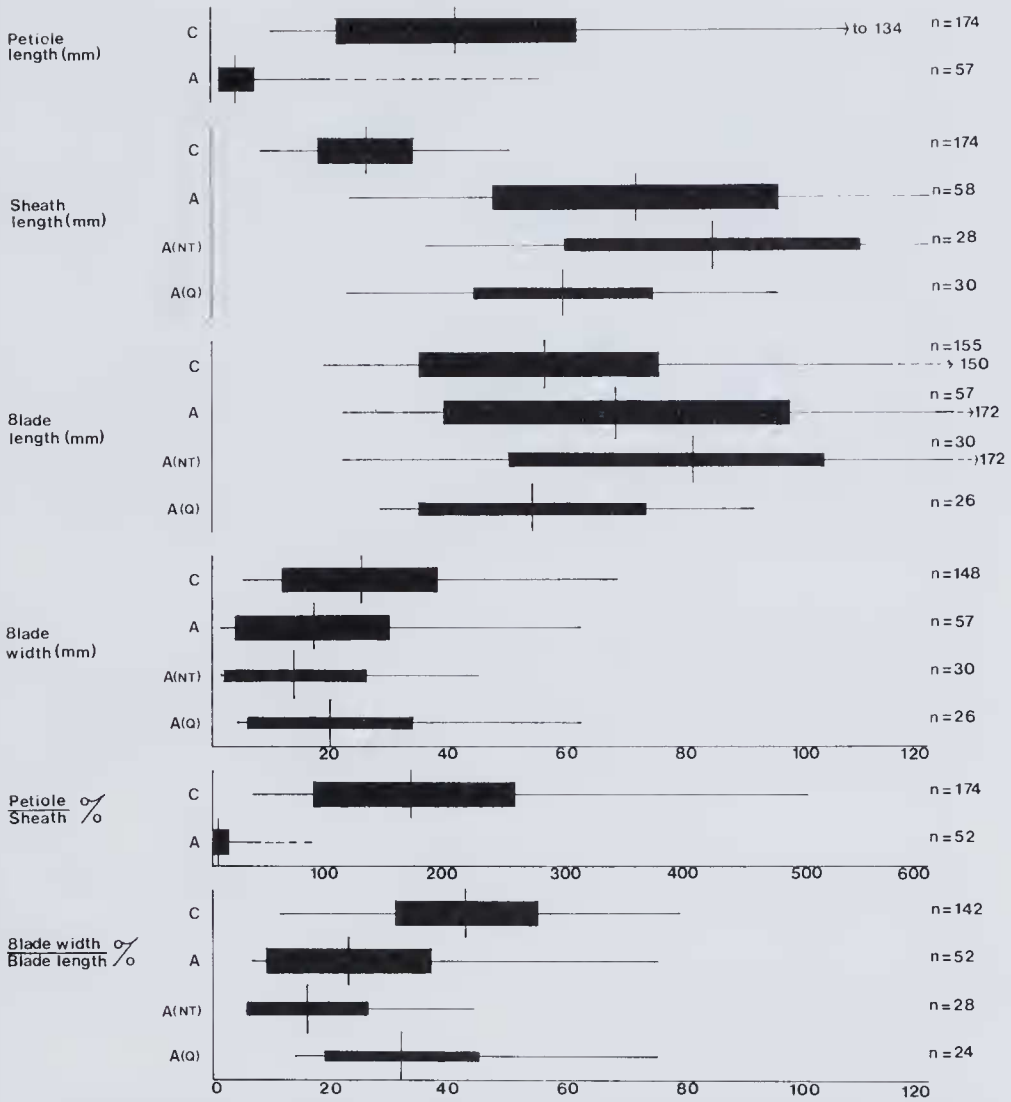

Fig. 3. Measurements and proportions of the infloresence leaf in *Monochoria*. For explanation see caption to figure 1. Note that petiole signifies that portion of the petiole between the sheath and the blade.

November as cited by Ridley, and that the collector's number is 81, not 8 as published. Ridley obviously cited the month of receipt at Kew instead of the month of collection.

The isotype material is visually typical of the narrow-leaved, short-petioled, rather glaucous plants which constitute the *M. australasica* collections from the Northern Territory and, with the width/length % of the leaf blade being only c. 11%, represents the most narrow-leaved forms of these. In addition, except for the slightly short style plus stigma (5.4 mm and 5.5 mm on the two flowers softened), all measurements fall within the standard deviations indicated above for the group. The colour photograph of the holotype sheet agrees well with the isotype material examined.

Monochoria cyanea (F.Muell.) F.Muell., Fragmenta phytographiae Australiae 8:44 (1873). *Limnostachys cyanea* F.Muell., l.c. 1:24 (1858). TYPE: "In terra Arnhem's Land. Leich-

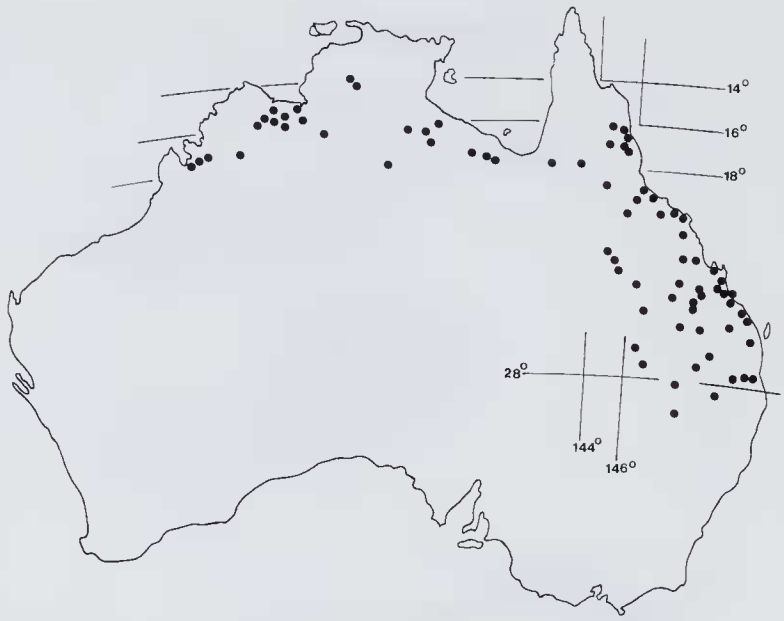

Fig. 4. Distribution of *Monochoria cyanea*.

Fig. 5. Distribution of *Monochoria australasica*.

hardt. Ad flumen Victoriae." LECTOTYPE (here chosen): "Limnostachys cyanea — Victoria River ferd Mueller" in Mueller's hand on plain blue label (K). SYNTYPES: "Pontodera Depot Creek Trop. Australia? Mueller (no label)" on plain blue label in unknown hand (K). "- - - - Rocky basin of Depot Creek April 56. ferd Mueller" on cream-coloured label, also "Monochoria vaginalis Presl Upper Vict. Riv 1856" on blue label, both in Mueller's hand (MEL 665252). "Victoria River ferd Mueller" in Mueller's hand on plain blue label (MEL 665251).

The Kew sheet chosen as lectotype is the only sheet which carries Mueller's identification of *Limnostachys cyanea* and also carries appropriate collection data. Although unstated on the label, the date of collection must have been 1855-56 as that is the only occasion on which Mueller visited the Victoria River. This satisfactorily predates the publication date for the basionym of 1858. The one flowering plant on the sheet is obviously representative of the broad-leaved, long-petioled, *M. cyanea* collections.

Although Mueller cited Leichhardt material from Arnhem Land, no such material has been located at either K or MEL. However, it is possible that the syntype sheet at K could be Leichhardt material as the label information is indefinite and appears to indicate that it

was tentatively provided last century by somebody at K after the sheet was located without any original label. Material on the sheet is somewhat varied in appearance.

The syntype MEL 665252 contains one plant in flower and an isolated basal leaf. The plant is vegetatively smaller than that of the lectotype sheet but equally as representative of *M. cyanea*. The blue label giving Mueller's identification of *Monochoria vaginalis* is possibly erroneously present or else merely indicative of an early identification by Mueller. The locality Depot Creek, shown on the alternative label, is in the vicinity of the Victoria River and supports the acceptance of this collection as some of the original material used by Mueller in describing *Limnostachys cyanea*.

MEL 665251 contains a mixture of plant portions and fragments whose characteristics collectively embrace the range shown by plants on the other three type sheets.

From the total type material eleven measurements were made for each vegetative and inflorescence feature. Floral structures were measured wet from 3 flowers from the MEL sheets, but otherwise were measured dry on both the MEL and K sheets to avoid damage. For most characters the range of measurements obtained embraced all or part of the standard deviation charted above for *M. cyanea* and extended beyond that towards, or sometimes into, the standard deviation shown for *M. australasica* (e.g. style plus stigma = c. 4.5-5.6; anther = c. 2.0-2.8; petiole/sheath = (15-)37-105(-118)%; inflorescence leaf, width/length = 30-62%; spike length/no. of flowers = 4.5-9). That is, the type material consists of plants which, through both measurements and general appearance, undoubtedly belong with *M. cyanea* but tend to be a little atypical of the taxon.

ACKNOWLEDGEMENTS

To Dr K. L. Wilson, National Herbarium of New South Wales, Sydney, and Mr J. R. Clarkson, Mareeba branch of the Queensland Herbarium, for special field collections of *Monochoria*, to Drs J. H. Ross and P. S. Short, National Herbarium of Victoria, for critical comments on a draft manuscript, and to Miss B. J. Sweatman, National Herbarium of Victoria, for preparation of the figures, I am most grateful.

REFERENCES

Backer, C. A. (1951). Pontederiaceae. *Fl. Malesiana* Ser.1., 4:255-261.
Verdcourt, B. (1960). The genus *Monochoria* Presl (Pontederiaceae) in Africa. *Kirkia* 1:80-83, tabs 8-12.

Manuscript received 23 August 1984.